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ABSTRACT

A complete bibliographic reference and an abstract are given for each publication of the Human Factors Laboratory from 1976-1978, including journal articles and conference proceedings papers which members of the Laboratory published during the same period. Three indexes--index by source (contractor or in-house), author index, and subject matter index--are also provided. (Author)

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Human Factors Laboratory
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SUMMARY

This document is the third supplement to the Annotated Bibliography of Human Factors Laboratory Reports (1945-1968), Technical Report: NAVTRADEVCEN IH-158, February 1969, AD 686174. It provides a complete bibliographic reference and an abstract for each technical report of the Human Factors Laboratory published from 1976 through 1978. The citations are followed by journal articles and conference proceedings papers of members of the Human Factors Laboratory published during the same period. Three indexes, Index by Source (contractor or in-house), Author Index, and Subject Matter Index are also included.

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1976

1. Hausser, D., Blaiwes, A. S., Weller, D. and Spencer, G. Application of computer-assisted instruction to interpersonal skill training. NAVTRAEQUIPCEN 74-C-0100-1, Contract N61339-74-C-0100, University of Michigan Institute for Social Research. Jan. 1976, 109pp. AO21474.

   A study was conducted to investigate the application of the PLATO IV system to training interpersonal skills. Suitable content areas were chosen and a mechanism to integrate various skill areas was designed. Training materials for this integration of skills were developed and coded into the PLATO IV system. A sample of experimental and control company commanders was tested and trained. Data about their on-the-job performance in the skill areas, as well as their companies' performance were collected and analyzed. It appears that the training had an effect on skill performance of company commanders, and indirectly on the attitudes and beliefs of their recruits. Less effect on company performance was observed, but there is evidence that the skill areas trained are related to success criteria used.

2. Montemerlo, M. D. and Tennyson, M. E. Instructional systems development: Conceptual analysis and comprehensive bibliography. NAVTRAEQUIPCEN IH-257, Naval Training Equipment Center. Feb. 1976, 286pp. AO24526.

   This report constitutes a first step in improving the state-of-the-art of instructional systems development (ISD). It contains a bibliography of about 4,000 entries divided into the following sections: instructional systems development/systems approach to training, evaluation, methodology selection, media selection, programmed instruction/computer assisted instruction, task analysis, job analysis, task taxonomy, specific behavioral objectives, sequencing, instructor training, educational management, cost effectiveness, innovation, educational technology, human engineering, simulation, and systems analysis/operations research.

   This report also presents a conceptual analysis of ISD, a process which is also known as: the systems approach to training (SAT), systems engineering of training (SET), training situation analysis (TSA), and the design of instructional systems (DIS). The related literature, dating from 1951 to the present, indicates the state-of-the-art to be unsettled. Over 100 ISD manuals are available which contain fundamental disagreement on the most basic aspects of course design. None of the manuals have been empirically validated. In an effort to understand the present state of affairs with respect to ISD, its history was researched. Its evolution was traced from its beginning in systems analysis, to the systems analytic approach to training, to the proceduralized systems approach to training, which is now known as ISD. The factors which affected this evolution, the current state-of-the-art, and the major questions which remain unanswered are discussed.

3. Puig, J. A. and Gill, S. Evaluation of an automated flight training system: Ground controlled approach module (GCAM). NAVTRAEQUIPCEN IH-264, Naval Training Equipment Center. Feb. 1976, 66pp. AO21533.

   An experiment was conducted to determine the effectiveness of an automated, adaptive system in training Naval aviators to fly ground controlled approaches (GCA's). The training course was comprised of severn different types of GCA's, arranged in order of increasing difficulty. The GCA Module (GCAM) was integrated with a TA-4J Operational Flight Trainer (Device 2F90). Comparison of automated and conventional training was made. In general, the hypothesis that training with the automated system would be as effective as conventional instructor training, was confirmed.

4. Feurzeig, W., Lukas, G. and Huggins, A. W. F. Higher order adaptive training systems. NAVTRAEQUIPCEN 75-C-0104-4, Contract N61339-75-C-0104, Bolt Beranek and Newman, Inc. Feb. 1976, 39pp. AO23594.

   A computer-based instrument flight simulation system, ORLY, has been developed as the framework for an automated diagnostic and training facility. ORLY-based protocol experiments were designed in which student pilot difficulties shown in the course of carrying out IFR tasks were described and diagnosed by instructor pilots. Case studies of initial instructor protocols are described. Protocol analysis procedures and problems are discussed.

5. Charles, J. P., Willard, G. and Healey, G. Instructor pilot's role in simulator training. NAVTRAEQUIPCEN 75-C-0093-1, Contract N61339-75-C-0093, Appli-Mation, Inc. Mar. 1976, 98pp. AO23546.

   Instructor Pilot's Role in Fleet Pilot Training using simulation was reviewed at the Readiness Training Squadron and Fleet Aviation Specialized Operational Training Group Detachments. The role of the simulator operator/technician was also reviewed. Both current and advanced operational flight trainers were analyzed. Conclusions and recommendations were developed.

6. Vreuls, D., Wooldridge, A. L., Obermayer, R. W., Johnson, R. M., Norman, D. A. and Goldstein, I. Development and evaluation of trainee performance measures in an automated instrument flight maneuvers trainer. NAVTRAEQUIPCEN 74-C-0063-1, Contract N61339-74-C-0063, Canyon Research Group, Inc. May 1976. 112pp. AO24517.

   A simulator study was conducted to improve training performance measurement selection methods, apply the results to an automated flight system and conduct an evaluation of resulting measurement during automated training of four instrument flight maneuvers.

   Empirical methods were used to select from an analytically derived set, those measures which had the ability to discriminate between early and later training performance. The multiple discriminant model emerged as the best technique, but the algorithm for its use was highly

modified. The automated trainer was then modified to operate on three measurement subsystems: (1) the original scoring algorithm; (2) the measures and weighting coefficients based on multiple discriminant analysis results, and (3) the original scoring algorithm using measured normative data.

Resulting measurement was evaluated by automatically trained three matched groups of five civilian pilots each with the result that time-to-train was reduced 34-40% for pilots training with empirically derived measures over the original scoring algorithm. It was recommended that data collection at an operational site be undertaken to verify the methods and to produce information that might lead to a measurement specification for future devices. Recommendations concerning the design of adaptive logics were made.

7. Malone, T. B., Delong, J. L., Farris R. and Drumm, R. L. Advanced concepts of naval engineering maintenance training (Volume I of II). NAVTRAEQUIPCEN 74-C-0151-1, Contract N61339-74-C-0151, Essex Corporation. May 1976, 134pp. AO24860.

This study was concerned with the feasibility of applying various recent advances in instructional technology to maintenance training in the area of marine engineering. The study is divided into four principal sections: requirements analysis, media selection, training system description, and system development planning.

The requirements analysis identified all requirements which affect decisions concerning the use of instructional technology. Baseline job requirements were established for a representative course of maintenance instruction, the Hagan Automatic Boiler Control (ABC) course. These job requirements also included the tasks, skills, and knowledges for all relevant Hagan ABC maintenance functions.

This analysis was also utilized in the establishment of course requirements including course phasing requirements and course content segmentation. Finally, training system requirements were developed which identified system capabilities required to meet course requirements.

The media selection technique which was developed for this study is a procedure for evaluating candidate media/method approaches in terms of relative effectiveness, usability, and dollar cost. The delphi method was used to rate alternate media on specific criteria, to establish the relative importance (weighting) of criteria for each training objective, and to integrate the ratings and importance weights.

The proposed engineering maintenance training system incorporates an audiovisual element and a programmable, modular simulator. A set of functional specifications and software requirements for the proposed system were developed.

1976

8. Malone, T. B., Delong, J. L., Farris, R. and Drumm, R. L. Advanced concepts of naval engineering maintenance training (Volume II of II). NAVTRAEQUIPCEN 74-C-0151-1, Contract N61339-74-C-0151, Essex Corporation. May 1976, 179pp. AO24866.

   See Volume I abstract.

9. Puig, J. A. Requirements for color in television displays. NAVTRAEQUIPCEN TN 50, Naval Training Equipment Center. June 1976, 22pp. AO26747.

   A review of the literature was made as part of Task 6723-01, Wide-Angle High Resolution Color TV Techniques for Training Systems. Forty-one references were consulted, twelve of which described research in applied experimental settings. Subjects in ten of the twelve studies showed some improvement in performance as a result of using color in the displays. The decision as to whether a color or monochrome television system should be used appears to be dependent on the specific application and cost factors. If either type could be produced and maintained for equivalent costs, then there is evidence to suggest that performance with color TV would be as good, and for some applications, better than monochrome TV.

10. Breaux, R. B. Training characteristics of the automated adaptive ground controlled approach radar controller training system (GCA-CTS). NAVTRAEQUIPCEN TN-52, Naval Training Equipment Center. July 1976, 36pp. AO27503.

   An initial feasibility study outlined a training system for laboratory test and evaluation of an automated adaptive ground controlled approach controller training system for the precision approach radar. Evaluation of the initial system by GCA instructor led to a revision of the model and of the performance measurement system. This report concerns itself with that development process, with the current laboratory systems, and with implications for future training systems. The potential for team training by simulation of missing crew members is discussed.

11. Ahlers, R. H., Jr. Preliminary investigations concerning the training of tactical decision making behavior. NAVTRAEQUIPCEN IH-269, Naval Training Equipment Center. July 1976, 32PP. AO28722.

   An accelerating trend for military decision making in command and control situations is to provide the decision maker with statistically processed data. There are obvious benefits to be derived from training a decision maker to be a more efficient user of such diagnostic data. But there is little empirical evidence that training is effective in bringing about an enhancement of decision making performance.

   Two experiments are reported in which it was attempted to determine the effectiveness of a scenario approach for training individuals to make an abstract type of tactical decision based upon probabilistic data. Two questions were of interest in the first experiment:

(1) Can appropriate decision making behavior be shaped without providing specific training in the underlying statistical principles? and, (2) Can an adaptive training procedure be successfully utilized in the training of a cognitive skill such as decision making? The second experiment was designed to evaluate a technique of providing performance feedback in order to maintain subject motivation.

It was found that decision making behavior can be shaped without providing explicit training in the underlying statistical principles. An automated, adaptive procedure offered certain advantages for structuring the training session. The performance feedback which was inherent in the adaptive model appeared to provide sufficient motivational cues.

12. Cohen, J. L. and Fishbein, M. A field test of the PLATO IV system for company commander behavioral change training. NAVTRAEQUIPCEN 74-C-0095-1, Contract N61339-74-C-0095, University of Illinois. July 1976, 128pp. AO27701.

A field experiment was carried out at the Recruit Training Command, San Diego, to test the effectiveness of utilizing the PLATO IV system for behavioral change training. Thirty-eight company commanders were randomly assigned to either the experimental (training) or the control (no training) group. The results showed PLATO to be a highly effective device for changing behavioral intentions. PLATO also demonstrated effectiveness in changing behaviors.

13. Brictson, C. A. and Burger, W. J. Transfer of training effectiveness: A7E night carrier landing trainer (NCLT) Device 2F103. NAVTRAEQUIPCEN 74-C-0079-1, Contract N61339-74-C-0079, Dunlap and Associates, Inc. Aug. 1976, 93pp. AO28836.

Two groups of Navy pilots who had no prior A7E experience were given differential training in a Night Carrier Landing Trainer (NCLT) to determine the transfer of training to actual night carrier qualification (CQ) landing. The groups were matched on flight experience, training grades and amount of training. NCLT training was found to transfer positively to night carrier landing performance. Statistically significant differences were found in objective measures of night Landing Performance Scores (LPS) and night boarding rate as well as night LSO scores. Transfer of training was more pronounced and effective for inexperienced Category I pilots who were direct from the training command than for experienced Category I pilots. Radar measures of final approach substantiated the night performance differences and indicated that NCLT trained pilots showed more precision in vertical flight control than the non-trainer pilots. Attrition rate was four percent for NCLT pilots compared to 30 percent for the no-trainer group. An extra 12 weeks training and 19 percent more flight time were required to qualify the attrites when they were recycled through CQ training. Implications for future training of carrier pilots and potential savings in training and flight time are discussed. Recommendations for other NCLT training research and changes in NCLT aircraft response dynamics and relative motion cues are also presented.

1976

14. Burger, W. J. and Brictson, C. A. A7E transfer of training effectiveness: Device 2C15A CPT and Device 2F84B OFT/WST. NAVTRAEQUIPCEN 74-C-0079-2, Contract N61339-74-C-0079, Dunlap and Associates, Inc. August 1976, 55pp. AO27691.

    Training effectiveness and efficiency of two A7 aircraft training simulators was assessed within their operational training environment using a qualitative assessment method. Devices evaluated were the Cockpit Procedures Trainer (Device 2C15A) and Operational Flight Trainer/Weapon Systems Trainer (Device 2F84B). Observation of training activities, review of training syllabi and intensive interviews with 13 Phase Officers and Instructor Pilots were conducted. Results indicate that (1) both devices are effective trainers, (2) the CPT rates low on efficiency due to design and datedness of material, and (3) the OFT/WST is a relatively efficient trainer. Recommendations for enhancing efficiency of both devices, especially the OFT/WST are presented along with guidelines for the design of future simulator devices.

15. Grady, M. W. and Hicklin, M. Use of computer speech understanding in training: A demonstration training system for the ground controlled approach controller. NAVTRAEQUIPCEN 74-C-0048-1, Contract N61339-74-C-0048, Logicon, Inc. Dec. 1976, 150pp. AO33327.

    This final report traces the evolution of the development of the Ground Controlled Approach Controller Training System (GCA-CTS) from a feasibility demonstration to a preliminary training system. The GCA-CTS combines speech understanding, performance measurement, and adaptive syllabus control; thus the report traces the development and application of these technologies to the controller training problem. In addition, the report describes a generalized research tool, the Voice Data Collection (VDC) program, which supports the investigation of the advanced speech technologies in a variety of other training situations.

16. Sugarman, R. C., Johnson, S. L., Mitchell, J. F., Hinton, W. M., Jr. and Fishburne, R. P., Jr. E-2C Systems approach to training: Phase I. NAVTRAEQUIPCEN 75-C-0101-1, Contract N61339-75-C-0101, Calspan Corporation. December 1976, 120pp. AO36264.

    A revision of the instructional system for the E-2C was developed to enhance the cost-effectiveness of the training. The five-man E-2C crew consists of a pilot, copilot, combat information center officer (CIC), air control officer (ACO), and flight technician (FT), with training for these positions being conducted at RVAW-120, Norfolk Naval Air Station. This project followed the principles of Instructional System Design (ISD). After completing a task analysis for each position, the analysts prepared (in sequence) behavioral objectives, training support (media) requirements, and lesson specifications. To support the effort, information was collected relevant to entry level behavior of trainees, existing resources available, and external influences (constraints) that impact on the training system.

The proposed syllabi incorporate a shift in emphasis toward: earlier "hands-on" training, modified self-paced (individualized) instruction for most of the academic lessons; and a comprehensive plan for criterion-referenced performance assessment throughout the progression of cognitive (i.e., adademic), practice, and sortie/scenario lessons.

After the implementation and validation process is carried out in Phase II, it is expected that significant reductions in training costs will be achieved through a shorter total course length, a greater proportion of synthetic training relative to in-flight practice, and a quality control program.

This report documents a particular implementation of ISD methods and procedures selected by the contractor, which will be compared by the Navy to other aircrew training program developments. Data provided will allow evaluation of the methodology, definition of the constraints and operating conditions that impact on aircrew training, and acquisition of cost, scheduling and manpower data for future ISD planning.

1977

17. Lukas, G., Blaiwes, A. S. and Weller, D. Evaluation of human relations training programs. NAVTRAEQUIPCEN 75-C-0076-1, Contract N61339-75-C-0076, Bolt Beranek and Newman, Inc. Jan. 1977, 179pp. AO37536.

    An evaluation was made of computer assisted instruction on human relations skills implemented on the PLATO IV computer system. These materials had been devised for use by company commanders (CCs) at Naval Recruit Training Commands (RTCs) and were tested at the Orlando and San Diego RTCs. A substantial improvement on the part of CCs, and recruits of CCs undergoing this instruction, was found. Also, case study scenario-based materials were implemented on PLATO IV for complementary training in interpersonal skills.

18. Hughes, J. A. and Hymes, J. P. A study of the effectiveness, feasibility, and resource requirements of instructional systems development: EA-6B readiness training. NAVTRAEQUIPCEN 75-C-0100-1, Contract N61339-75-C-0100, Courseware, Inc. Jan. 1977, 295pp. AO35616.

    This project was one of four aircrew training development projects sponsored by the Naval Training Equipment Center (NAVTRAEQUIPCEN) in a continuing study of the methodology, effectiveness, and resource requirements of Instructional Systems Development (ISD). It was a Phase I effort, covering ISD phases through lesson specification. Project goals were to study the effectiveness, feasibility, and resource requirements of full-scope ISD, and to support the Replacement Aircrew Training Squadron in its training program development efforts. First, project goals, assets, and constraints were determined. A task listing of the two crew positions was performed. The listing was validated on operational squadron members through a survey, which also provided data used to select tasks to be trained. Tasks were analyzed into a hierarchical structure of supporting skills and knowledges, which served as the basis for formulation of instructional objectives. Objectives were organized and sequenced, and alternative media selected for each lesson. Resource requirements were calculated for four alternative media mix plans to aid in resource planning for later development and implementation. Lesson specifications (detailed instructional development blueprints) were begun for the 1186 objectives, but were not completed due to a shortage of subject-matter experts. It was concluded that the ISD model used was feasible and sufficiently prescriptive for standardized employment. Data on personnel requirements were gathered and processed into a table for estimating personnel requirements in future projects. Recommendations were made for modifications to the basic ISD model and procedures, and for improved ISD implementation methods.

19. Campbell, S. C., Feddern, J., Graham, G. and Morganlander, M A-6E systems approach to training: Phase I final report. NAVTRAEQUIPCEN 75-C-0099-1, Contract N61339-75-C-0099, Grumman Aerospace Corp. Feb. 1977, 88pp. AO37468.

    This report describes one of four Phase I programs, namely the A-6E TRAM Instructional Systems Development (ISD) Program, established to evaluate the application of a Systems Approach to Training (SAT) in Naval aircraft programs. The research and development goals of this program were to: (a) evaluate a variety of ISD methods and procedures as applied to the aircrew training, (b) achieve a better understanding of the constraints and operating conditions that affect aircrew training, and (c) acquire cost, scheduling, and manpower data for future ISD planning. The operational goal was to design an A-6E TRAM aircrew training program.

    The approach used to achieve the above goals conformed basically to the ISD methodology. The report discussed the Task Analysis, the development of Specific Behavioral Objectives (SBOs), the selection of instructional media, and the formulation of Lesson Specifications.

    The role of the Subject Matter Expert (SME) is reviewed, as is the requirement for quantitative standards of performance. The operational aspects of the A-6E Training Program are addressed: program costs and manpower data are included. Specific media requirements and recommendations are presented. Generic descriptions of appropriate training devices are provided. The report includes a number of conclusions and recommendations and a 30-item reference section.

20. Ricard, G. L. and Puig, J. A. Delay of visual feedback in aircraft simulators. NAVTRAEQUIPCEN TN-56, Naval Training Equipment Center. Mar. 1977, 38pp. AO37839.

    The literature of the manual control of systems incorporating delays in the presentation of visual information is reviewed for the development of specifications for flight simulator visual displays. Several cases are presented where display delays have affected the use of operational simulation devices, and the means currently used to contend with those delays are discussed. Two approaches to preparing specifications are offered and available information relevant to each is presented.

21. Porter, J. E., Grady, M. W., Hicklin, M. B. and Lowe, L. F. Use of computer speech understanding in training: A preliminary investigation of a limited continuous speech recognition capability. NAVTRAEQUIPCEN 74-C-0048-2, Contract N61339-74-C-0048, Logicon, Inc. Jun. 1977, 134pp. AO49680.

    This report describes the requirements for connected word speech recognition in training systems design. A review of the published literature and commercially available systems demonstrates that

no existing capability exists which fully satisfies the unique features of speech recognition in training devices. A new approach toward limited continuous speech recognition was investigated based on examining the speech data itself to find characteristic sound structures; the order in which these sounds occur; and the time duration of, and between, these characteristic sounds.

Algorithms were developed and exercised over speech data generated by a commercial preprocessor for a large number of utterances spoken by a single speaker. Characteristic structure was found for the 10 digits and the work "point." Borrowing from the mathematical theory of formal languages, these "sounds" are termed transition letter sets. The residual data were formed into loop letter sets which are used to reduce false recognitions. Nondeterministic finite transducers, defined by the transition and loop letter sets for each vocabulary item, were exercised over entire utterances to validate the basic concepts and extract time duration data.

While the complete implementation and testing of this mathematical machine approach toward limited continuous speech recognition remains incomplete, the preliminary results have verified the basic assumptions and provided the encouragement to proceed with the development of the technique.

22. Chatfield, D. C. and Gidcumb, C. F. Optimization techniques for automated adaptive training systems. NAVTRAEQUIPCEN 77-M-0575, Contract N61339-77-M-0575, Texas Tech University. Jul. 1977, 58pp. AO52631.

As adaptive training systems are developed, the big problem encountered is the development of an adaptive logic. Current systems develop their branching schemes without direct usage of learning models. The literature presently contains several new techniques for optimizing instruction. These techniques make use of current learning models by which to make trial-by-trial estimates of the student's progress in learning. This information is then used to solve a set of equations which would select an optimal instructional alternative. Optimal decisions are made by selecting the instructional alternative for which the largest marginal gain in learning is predicted. The present task was to review the techniques available which present the greatest feasibility for applications in the developing training systems. The various optimization techniques selected were presented in their most general form so that the variety of their applications might be apparent. It was concluded that the optimization techniques reviewed were quite feasible and have many powerful options to offer.

23. Grady, M. W., Hicklin, M. B. and Miller, R. M. Air intercept controller training: A preliminary review. NAVTRAEQUIPCEN 77-M-1058-1, Contract N61339-77-M-1058, Logicon, Inc. Jul. 1977, 115pp. AO48796.

    This report describes the current Air Intercept Controller (AIC) course conducted by the Navy. The report discusses the utilization of advanced technologies and training system designs to improve the AIC training program.

24. Montemerlo, M. D. Training device design: The simulation/stimulation controversy. NAVTRAEQUIPCEN IH-287, Naval Training Equipment Center. Jul. 1977, 75pp. AO49973.

    Hands-on practice is a necessary aspect of most instructional programs, and training devices are an accepted method for providing such practice. However, the relative effectiveness of two different types of training devices, synthetic trainers and actual equipment trainers, for providing this practice is a matter of controversy. In the absence of a definitive answer, many training organizations have adopted policies limiting procurement to one type of device or to the other. Yet, the successes that have been achieved with both types indicate that neither is inherently superior to the other. This report enumerates seven factors which have been found to affect the relative effectiveness of synthetic and actual equipment trainers in particular situations: they are cost, reliability, maintainability, safety, facility requirements, training features, and modifiability. Examples are provided from the fields of: vehicle operator training (e.g., pilots, helmsmen, astronauts), equipment operator training (e.g., power plant, and sonar operators) and maintenance training. Special chapters are included on pierside trainers and on synthetic maintenance trainers. The purpose of this report is to aid those in a position to select synthetic and actual equipment trainers by making available to them the findings of others in a variety of training situations.

25. Charles, J. P. and Johnson, R. M. Automated weapon system trainer: Expanded module for basic instrument flight maneuver. NAVTRAEQUIPCEN 74-C-0141-1, Contract N61339-74-C-0141, Appli-Mation, Inc. Aug. 1977, 200pp. AO48498.

    Previous studies have demonstrated the conceptual and technical feasibility of automated and adaptive aviation simulator training. This study was concerned with exploring the impact of operational syllabi and training requirements on these advanced techniques. The Advanced Jet Instrument Training Syllabus was selected and analyzed. A demonstration of the application of automated and adaptive techniques to the syllabus was conducted utilizing the R&D simulator at the Naval Training Equipment Center. Several new approaches to performance measurement, syllabus structuring and training control were developed to meet the syllabus requirement and training objectives. The techniques and applications were successfully demonstrated.

1977

26. Charles, J. P. Instructor pilot's role in simulation training (Phase II). NAVTRAEQUIPCEN 76-C-0034-1, Contract N61339-76-C-0034, Appli-Mation, Inc. Aug 1977, 57 p. AD47919.

Analyses of instructor pilot functions in training pilots using simulation were performed. The functions were based on the review of current simulation training conducted in the Phase I study, NAVTRAEQUIPCEN 75-C-0097-1. Feasibile allocations of functions were made and modular implementation concepts developed.

17

1978

27. Daniels, R. W., Alden, D. G., Stackhouse, S. P. Generalized sonar operator training: Functional specification and evaluation plan. NAVTRAEQUIPCEN 75-C-0095-1, Contract N61339-75-C-0095, Honeywell, Inc., Systems and Research Center. Jan. 1978, 151pp. AO53179.

The objectives of this program were to develop the functional specifications and an evaluation plan for a Generalized Sonar Operator Training (GenSOT) system. A previous study had established GenSOT feasibility based upon similarities among the tasks, skill, and knowledge required to operate a variety of surface and subsurface sonar systems. The current program focused upon implementation feasibility.

The development of GenSOT was considered because a more cost-effective solution for sonar operator training was needed. A training system was specified which is postulated to have the following advantages:

- Increased sonar operator proficiency per unit of training time and cost.
- Decreased time required for skill transfer from one sonar system to another.
- Increased sonar operator understanding of the basic functions of sonar equipment to ensure optimal equipment operation.

In addition, the following plans were prepared to evaluate the concept under operational conditions:

- A plan for the introduction of GenSOT into the overall sonar operator training sequence.
- A plan for measuring the cost of GenSOT and comparing those costs to current costs.
- An experimental design for comparing the effectiveness of GenSOT with current sonar operator training.

28. Saleh, J., Leal, A., Lucaccini, L., Gardiner, P., Hopf-Weichel, R. Analysis of requirements and methodology for decision training in operational systems. NAVTRAEQUIPCEN 77-C-0005-1, Contract N61339-77-C-0005, Perceptronics, Inc. Feb. 1978, 207pp. AO60028.

To an ever-increasing extent, the operators of advanced military systems, such as aircraft, ships, weapons, C3, etc., act primarily as decision makers. Such job characteristics demand inclusion of decision training into the conventional military training programs. Within the past several years, the general rules of effective decision making have been consolidated into the technical area termed "decision analysis." During the same period, the system approach to training has established a generalized methodology for dealing with diverse content areas in the design of training courses. This report

describes the results of a one-year research and development program aimed at bringing these two areas together in order to define the decision-training objectives of typical military systems and to specify ways of meeting them in terms of a set of guidelines for generation of instructional materials for decision training systems.

The program is divided into four phases: (1) Job analysis phase, (2) decision task analysis phase, (3) development and evaluation phase, and (4) documentation phase. In the first phase, the SH-2F Light Airborne Multi-Purpose System (LAMPS) helicopter training system was analyzed. Based on this analysis, the decision situations that occur during emergency and tactical system operations were identified, and a number of decision tasks required to resolve a selected set of decision situations were chosen. These decision tasks were the input to the second phase where they were analyzed to identify the required facts, the underlying concepts, the decision rules, and the step-by-step procedure that determine the optimal choice of alternatives. Based on the results of this analysis, instructional guidelines were produced in the third phase. An evaluation plan was developed and decision aid systems, to enhance the effect of the decision training program, were suggested.

During the one-year program a system to generate instructional guidelines for a task-specific decision training program, in any training environment, was developed. The system selects the most effective instructional method and media and provides required instructional contents for any specific decision task, subject to training in a specific training environment. The project has been aimed not only to develop a systematic procedure for providing instructional guidelines for decision tasks encountered in LAMPS Anti-Submarine Warfare (ASW) operation, but also to design a task-independent methodology in order to make application of the system in other task domains subject to minimal modification effort. Such a methodology allows incorporation of general purpose decision training components into task specific decision training programs. This incorporation provides trainees with the basic skills required for making task-specific decisions within a new domain, in case of their transfer to other domains. Furthermore, since the characteristics of decision tasks within any specific domain are subject to change with time, the methodology will allow development of more effective training programs even in the case where there is no possibility of transferring the trainees to other task domains.

The program concentrated on two major areas in the Navy LAMPS (ASW) Operation: emergency operations and tactical operations. The methodology for both areas as well as the specific activities for the emergency operations are included in this report. The results of the specific activities for the tactical operations are described in a separate classified supplement.

1978

29. Gibbons, A. S., Hymes, J. P. SH-2F LAMPS instructional systems development: Phase II, final report. NAVTRAEQUIPCEN 76-C-0055-1, Contract N61339-76-C-0055, Courseware, Inc. Mar. 1978, 292pp. AO58793.

This project was one of four aircrew training development projects sponsored by the Naval Training Equipment Center in continuing study of the methodology, effectiveness, and resource requirements of the Instructional Systems Development process. It was a Phase II effort covering the ISD tasks from authoring through implementation and evaluation of the instructional system. Project goals were to study the effectiveness, feasibility, and resource requirements of full-scope ISD, and to support the Fleet Readiness Squadron in its training program development efforts. Instructional materials were authored and subjected to a review process, produced in a tryout form and subjected to a tryout with typical students. Revisions were made as appropriate to the instructional materials, following which they were produced in a form suitable for the implementation and evaluation of the entire instructional system. An evaluation plan was written to support evaluation for small-scale tryouts and for the large-scale tryout, and an implementaion plan was written to prescribe the procedures and practices to be observed during management of the instructional system in actual use. When all materials had been tried out and produced in final form, the instructional system was implemented at two sites: Naval Air Station, North Island, on the West Coast and Naval Air Station, Norfolk, on the East Coast. Data was collected on the performance of the system and on performance of the instructional materials, and revision specifications were written as necessary. An instructor training course was developed and implemented to train instructors in specific tasks attendant to implementation of the instructional system. It was concluded that the ISD model used was robust and produced instructionally effective materials. Data on personnel requirements were gathered and reported. A review of the effecttiveness of the instructional development model was made on a step-by-step basis, and suggestions for the future implementation of ISD in the Navy were made.

30. Prophet, W. W. U. S. Navy fleet aviation training program development. NAVTRAEQUIPCEN 77-C-0009-1, Contract N61339-77-C-0009, Seville Research Corporation. Mar. 1978, 85pp. AO55788.

Four specific aircraft training program development efforts (A-6E, E-2C, EA-6B, and SH-2F) were examined and compared as to methodology and procedures used. The four efforts embodied principles of the Systems Approach to Training (SAT) and/or Instructional Systems Development (ISD). Three different contractors were involved, and the programs were under the technical direction of the Naval Training Equipment Center. The four projects carried through the point in the SAT/ISD process of development of lesson specification documents. In addition to examining procedural and methodological differences of the four programs, the report also described the various program products and examines their utility for subsequent steps in the SAT/ISD process.

The report also examines the general model that has been evolving in a variety of NAVTRAEQUIPCEN sponsored efforts for the conduct of SAT/ISD programs. The model and its associated documentation are examined in terms of their utility for aviation training program developmental efforts.

The report concludes that these various activities have advanced the Navy's capabilities significantly for the development of more effective aviation training program efforts in the future. Several areas are suggested for further improvement of the model. These include: (1) making it more applicable to complex in-cockpit psychomotor skills (as contrasted with cognitive skills); (2) techniques of flight performance measurement, and (3) means of enhancing the role of simulator training in the model.

31. Blaiwes, A. S., Weller, D. R. and Romot, G. Development and implementation of a computerized evaluation and training system (CETS) at a Recruit Training Command. NAVTRAEQUIPCEN IH-300, Naval Training Equipment Center. Mar. 1978, 46pp. AO54422.

This report documents a one-year effort in which some of the results of an earlier research and development project were prepared for implementation at a Recruit Training Command. This project concerned computer-based instruction for recruit company commanders in the affective and communication skills areas. In an ongoing continuation of this effort, the more complete preparation, implementation, and evaluation of these capabilities are underway.

The program involved the use of a stand-alone computer-based system for evaluating and training company commanders and for obtaining information needed for managing Recruit Training Command operations in general. In accomplishing these functions, the computer controlled the operation of a video tape player and a card reader in addition to some more traditional components of a computer-based training system. A new computer language was developed especially for facilitating the transfer of some programs previously prepared in PLATO IV coding to a form compatible with the current computer system.

Preliminary efforts to evaluate the feasibility and desirability of these programs indicated that the system can operate as intended in the operational setting and that its acceptance by Recruit Training Command personnel is generally favorable. The results also indicated that the system would entail relatively small expenditures to acquire, operate, and maintain.

32. King, W. J. and Duva, J. S. ATE: Bane or blessing for the technician? NAVTRAEQUIPCEN IH-301, Naval Training Equipment Center. Mar. 1978, 98pp. AO56336.

Continuing its leadership of maintenance training R&D, the Human Factors Laboratory of the Naval Training Equipment Center, on 3-5 May 1977, convened the Second Biennial Conference on Maintenance Training and Aiding with the title: "ATE: Bane or Blessing for the Technician?" Automatic Test Equipment (ATE) has been put forward as an aid to the technician and it was the purpose of this conference to determine the extent to which this objective has been achieved.

Because the design and development of cost-effective training systems requires the laboratory to keep abreast of critical training problem areas in the Fleet, the Naval Air Systems Command (AIR 540F, CDR Paul Chatelier) directed in 1976 that a Technical Advisory Group (TAG) for maintenance training be established with objectives to:

- Establish a formal medium for the exchange of technical information through a series of biennial conferences and semiannual meetings to provide a broad interchange of maintenance research ideas.

- Plan and coordinate the two key areas of Maintenance Simulation and Training Devices, and Human Maintenance and Trouble-shooting Behavior.

It was under the TAG charter that the present conference on Automatic Test Equipment was called. Representation was fully tri-service both in terms of participants and attendees. As with the First Biennial Conference, the present invited participants had the advantage of having read all the papers prior to the meeting. Because of this familiarity with the technical content, a real exchange of technical data and knowledge was possible. Each participant had been asked to include some coverage of the following three elements of general interest.

- What is the author's involvement with ATE?

- What are the potential payoffs and penalties of ATE?

- How does the technician use and interact with ATE?

33. Brictson, C. A. A7 Training effectiveness through performance analysis. NAVTRAEQUIPCEN 75-C-0105-1, Contract N61339-75-C-0105, Dunlap and Associates, Inc. Apr. 1978, 60pp. AO56230.

Training concepts which emphasize landing performance analysis, diagnostic feedback and remedial instruction for novice A7 pilots are described. FCLP performance is analyzed to identify low performers who are potential recycle trainees. A Night Carrier Landing Trainer (NCLT) provides individualized remedial training to improve eventual

carrier landing performance. Results of a field test of the method are presented. Fleet performance of previous recycle trainees is reviewed and discussed along with recommendations for training implementation.

34. Porter, J. E. LISTEN: A system for recognizing connected speech over small, fixed vocabularies, in real time. NAVTRAEQUIPCEN 77-C-0096-1, Contract N61339-77-C-0096, Logicon, Inc. Apr. 1978, 100pp. AO56231.

This report describes the development of a system for recognizing connected speech in real time using a commercially available speech preprocessor, a minicomputer and programs written in FORTRAN. The system was tested on two speakers using the digits and the work "point" with inconclusive results. Recognition accuracy of 86 percent was achieved for one speaker whereas accuracy for the other speaker was lower (39 percent) due to an anomalous difference between training and test data for that speaker's voice.

35. Ricard, G. L., Cyrus, M. L., Cox, D. C., Templeton, T. K. and Thompson, L. C. Compensation for transport delays produced by computer image generation systems. NAVTRAEQUIPCEN IH-297/AFHRL-TR-78-46. Naval Training Equipment Center, Jun. 1978. 60pp. AO56720.

This report describes a cooperative Navy/Air Force effort aimed at the problem of image-flutter encountered when visual displays that present computer-generated images are used for the simulation of certain flying situations. Two experiments are described that extend laboratory work on delay compensation schemes to the simulation of formation flight in a research device -- the Advanced Simulator for Pilot Training. The scheme used was one where low-pass filters were added to the lead-generation software of the visual display system. Both studies were geared to determining break-points for those filters that would allow adequate flying control performance and provide an acceptable display. These experiments were based on the notion that a trade exists between the suppression of the visual image's flutter and the removal of the low frequency information necessary for flight control. One experiment represented a factorial combination of settings of the display filters and the non-visual cues of aircraft motion provided by the ASPT's g-seat and motion platform, and the second represented a simple comparison of filter settings. Both studies indicated that, at least for formation flight, there is a range of filter settings which will not adversely affect flight control and will adequately suppress visual flutter. This range represents half-power settings for the filters of 3/4 to 1 Hertz.

36. Charles, J. P. Instructor pilot's role in simulator training (Phase III). NAVTRAEQUIPCEN 76-C-0034-2, Contract N61339-76-C-0034, Appli-Mation, Inc. Jun. 1978, 57pp. AO61732.

This third phase of the study of the Instructor Pilot's Role in Simulator Training was concerned with the translation of the IP

functions into specification format. The problem addressed was the development of a conceptual subsystem which could be utilized for the demonstration of the defined IP console. The primary result of this study indicates that a console on flight IP skills and capabilities is feasible.

37. Hughes, J., O'Neal, F., Kearsley, G., O'Neal, H., Fee, M., Rodi, L. and Hermanns, J. Functional specifications for computer aided training systems development and management (CATSDM) support functions. NAVTRAEQUIPCEN 77-0018-1, Contract N61339-77-C-0018, Courseware, Inc. Jul. 1978, 121pp. AO61245.

The scope and complexity of major instructional design and development programs and the sophistication and detailed level of definition of particular training development models utilized have greatly increased. The advanced planning and day to day management necessary for such programs have become commensurately more difficult and complex. The interactions between the many resource personnel and schedule requirements involved increase the difficulty of identifying specific sources of problems and responding to them without causing problems elsewhere. In addition, the models being used tend to have an increasing number of engineering characteristics rather than artistic attributes. That is, they are characterized by increasingly well defined procedures and techniques which offer the potential for much better quality control consistency of output across different personnel, and they simplify the problem of training and standardizing approaches for development staffs. In response to the challenges of these emerging models interest is greatly increasing in comprehensive real-time integrated information management systems which incorporate a variety of flexible management projection and simulation capabilities, and which include rich arrays of standardized protocols, staff training materials, and interactive job aids. This report is a functional specification for a Computer Aided Training System Development and Management (CATSDM) environment based on state-of-the-art hardware and software technology, and including recommendations for off the shelf systems to utilize as a starting point in addressing the particular systematic training and instruction design and development model described in MIL STD 961 (often referred to as the Fleet Aviation ISD Model).

38. Hinton, W. M., Jr. F-4J/N Instructional systems development: Phase I final report. NAVTRAEQUIPCEN 77-C-0081-1, Contract N61339-77-C-0081, Allen Corporation of America. Jul. 1978, 153pp. AO61098.

This project was one in a continuing series of studies to upgrade Naval aviation aircrew training programs and at the same time to study the methodology, effectiveness, and resource requirements of Instructional Systems Development (ISD). It was a Phase I effort encompassing ISD steps from hierarchy development through training support requirements analysis. Project goals were to support the Marine and Navy Fleet Readiness Squadrons in their training program development efforts and to study the utility of the 6.2 ISD model in an application

to an existing aviation system. The latter goal included gathering information on the strengths and weaknesses of the model, making recommendations for modifications to the model, and collecting resource utilization data. Input data came from a validated list of pilot and RIO tasks which was furnished by the government. Tasks from this list were analyzed into a hierarchical structure of supporting skills and knowledge. This analysis formed the basis for the development of instructional objectives. Preferred and alternate media were selected for each of the objectives. Objectives were then grouped into lessons and the lessons sequenced to form the pilot and RIO syllabi. Finally, a training support requirements analysis was performed to estimate resource requirements for development, implementation, revision, and maintenance of the two training courses. Problems encountered during this program were discussed and recommendations for changes to the ISD model were presented.

39. Puig, J. A., Harris, W. T. and Ricard, G. L. Motion in flight simulation: An annotated bibliography. NAVTRAEQUIPCEN IH-298, Naval Training Equipment Center. Jul. 1978, 745pp. AO61687.

In support of Project 7744 - Motion Drive Signals for Flight Simulators, a review of the literature concerning motion simulation was conducted. Abstracts were included for 682 references. A primary objective of this review was to compare data from the various studies to identify general trends on the effects of motion on performance and training. The publications were listed alphabetically by author, chronologically, and also grouped into eight major categories as follows: reviews and bibliographies; equipment descriptions; requirements; algorithms and drive techniques; effections of motion, evaluation; vertical motion, and cost effectiveness.

40. Blaiwes, A. S. and Weller, D. R. A computerized evaluation and training system (CETS) for recruit training commands: An overview. NAVTRAEQUIPCEN IH-307, Naval Training Equipment Center. Nov. 1978, 36pp.

This report provides a synopsis of a six-year research and development effort to investigate the feasibility and desirability of using computer assistance to improve leadership and management practices at RTCs (Recruit Training Commands). Information has been derived on the suitability of two computer systems and various approaches for employing these systems in pursuit of this goal. These approaches encompass instruction and performance evaluation for Company Commanders (CCs) as well as more general information acquisition and processing capability to assist in the management of RTCs. Some of these programs are ready for operational use, while others would require considerable development and testing prior to operational implementation.

1978

41. Hooks, J. T., Butler, E. A., Gullen, R. K. and Petersen, R. J. Design study for an auto-adaptive landing signal officer (LSO) training system. NAVTRAEQUIPCEN 77-C-0109-1, Contract N61339-77-C-0109, Logicon, Inc. Dec. 1978, 207pp. AO64339.

This final report describes candidate performance capability requirements for an automated, adaptive Landing Signal Officer (LSO) training system. The system includes adaptive training control, a wide-angle visual system automated speech understanding, automated performance measurement and a simulated LSO workstation. The report traces the derivation of system capabilities by addressing LSO job analysis, LSO training requirements, system utilization syllabus, system functions and assessment of relevant technology. The report also includes the design of a laboratory system for concept demonstration and experimentation. A significant bibliography is included.

42. Weller, D. R. and Blaiwes, A. S. Computer-assisted judging and feedback of interpersonal skills. NAVTRAEQUIPCEN IH-308, Naval Training Equipment Center. Dec. 1978, 45pp. AO66222.

Training technology in the interpersonal skills area has not kept pace with the training technology that is available in most other skill areas. The deficiencies in interpersonal skills training are especially apparent in "job oriented" instruction, wherein the student performs operational tasks in simulated or actual job situations. A major obstacle to the application of job oriented instruction to this area is the difficulty in providing appropriate feedback to the student concerning his performance in the interpersonal situation.

One of the most popular approaches to satisfying this feedback requirement is to videotape the student in interpersonal situations. Most such efforts, however, fall quite short of providing appropriate feedback and the general failure to demonstrate training benefits from the use of this method can be attributed to this shortcoming. Further, the costs and difficulties associated with providing adequate feedback regarding interpersonal performance apparently have discouraged attempts to do so.

This report presents an approach for decreasing some of these costs and difficulties. This approach uses a computer to assist in the process of eliciting appropriate feedback from judges and providing this feedback to the student, both in coordination with the videotaped recordings of the student's performance. In this regard, computer programs designed to help a judge rate interpersonal performance along a variety of dimensions were developed and tested. Although these programs also are suitable for providing feedback to the student, formal tests of this aspect of the process were not conducted in the present research. Formal, albeit brief, experimental evaluations of the feedback elicitation and development programs were conducted, however.

Several potential benefits of the procedures for interpersonal skills training were demonstrated as a result of both the formal and informal tests of the system.

1976

43. Weller, D. R. and Blaiwes, A. S. Leadership dimensions of Navy recruit company commanders and recruit morale and performance. Psychological Reports, 1976, 39, 767-770.

Leadership dimensions and their relation to recruit satisfaction and performance were studied in 73 company commanders. Recruits completed questionnaires assessing company commanders' behaviors and recruits' attitudes. Factor analysis yielded four factors, Human, Informative, Warm, and Effective Communicator. The Human and Warm factors were consistent with interpersonal components found in prior research, but the Informative and Effective Communicator factors were only marginally consistent with task components found previously. Correlations were computed between the factors and the satisfaction and performance of recruits. All factors correlated significantly with recruits' satisfaction, but only the Human factor correlated significantly (negatively) with recruits' performance. Possible reasons for the lack of a traditional task component are discussed.

44. Feuge, R. L., Grady, M. W. and Breaux, R. Air tactical training and the automated speech technologies. Future of Simulators in Skills Training, First International Learning Technology and Exposition on Applied Learning Technology, Jul 1976.

Applications of the automated speech technologies of computer speech recognition and speech synthesis to pilot training were discussed. Specifically, speech synthesis was used to replace ground radar controllers and consideration was given for replacement of other team members such as the pilot, radar intercept officer, and weapon systems officer. The enhancement provided the overall system is to relieve the instructor of playing the role of these team members, and thereby provide increased efficiency and effectiveness of the instructor.

45. Puig, J. A. The training effectiveness of simulation. Proceedings of the First International Learning Technology Congress and Exposition, Washington, D. C., 21 - 23 Jul 1976.

A simulator, regardless of its technological sophistication will provide effective training only if used in a well designed and managed training system. Engineering complexity by itself does not guarantee effective training; training is far more dependent on psychological fidelity. For many years, the Naval Training Equipment Center has been engaged in a long term program of in-house and contractual studies designed to evaluate the effectiveness of training devices. This paper, by describing some of these studies, provides an indication of the effectiveness of simulation in training. Also, some of the problems that arise in attempting to conduct field evaluations, were discussed.

1976

46. Breaux, R. and Grady, M. W. The voice data collection program. Proceedings of the 9th NTEC/Industry Conference, NAVTRAEQUIPCEN IH-276, Orlando, Florida, 9-11 Nov. 1976. AO31447.

A generalized research tool for laboratory study of voice data for various vocabulary sets was described. The system allows run-time definition of any particular vocabulary, English text presentations as prompts to the speaker, automated voice synthesis prompts to the speaker, collection of voice patterns, verification of these patterns prior to creation of reference patterns, creation of reference patterns, and validation of the patterns. Output to the experimenter includes accuracy data, prompts, responses, statistical summaries, and parameter values available for adjustment.

47. Ricard, G. L., Norman, D. A. and Collyer, S. C. Compensating for flight simulator CGI system delays. In Proceedings of the 9th NTEC/Industry Conference, NAVTRAEQUIPCEN IH-276, Orlando, Florida, 9-11 Nov. 1976. AO31447.

Three experiments are presented that describe the development of a compensation scheme for the delayed visual feedback characteristic of flight simulator visual displays. The scheme consists of predicting future values for parameters which affect a display and then low-pass filtering them. The experiments present background data on the effect of delays, data for setting the break point of the filter, and a training assessment of the scheme.

1977

48. Blaiwes, A. S. and Weller, D. R. A social simulator: Development and evaluation. Education Technology, Mar.1977, XVII(3), 14-20.

    This report discusses the need for and characteristics of a simulator designed for training interpersonal skills. This discussion includes descriptions of initial efforts to develop and evaluate some aspects of such a "social simulator". The interpersonal situations between company commanders and recruits at Recruit Training Commands served as the primary vehicle for research and development in these efforts.

49. Breaux, R. B. Laboratory demonstration of computer speech recognition in training. In Proceedings of the 10th NTEC/Industry Conference, NAVTRAEQUIPCEN IH-294, Orlando, Florida, 15-17 Nov. 1977. AO47905.

    A system was described which provided a laboratory evaluation of the feasibility of the use of computer speech recognition in training. Results indicate potential manpower cost reductions and training enhancement. Follow-on experimental prototype system are described.

50. Breaux, R. B. Laboratory demonstration of computer speech recognition in training. Proceedings of the Workshop on Voice Technology for Interactive Real-time Command/Control Systems Application, Moffett Field, CA, 6-8 Dec. 1977, 109-116.

    A system was described which provided a laboratory evaluation of the feasibility of the use of computer speech recognition in training. Results indicate potential manpower cost reductions and training enhancement. Follow-on experimental prototype system are described.

51. Ricard, G. L., Cyrus, M. L., Cox, D. C., Templeton, T. K., and Thompson, L. C. Signal adjustments for formation flight in the ASPT. In Proceedings of the 6th Symposium on Psychology in the DoD. Apr. 1978, 147-151.

This is a preliminary report of an effort documented in NAVTRAEQUIPCEN IH-297/AFHRL-TR-78-46. In this report, an adjustment to the signals used to drive the ASPT CGI visual system is described that allowed the device to be used for formation flight, and some data related to the adjustment are presented.

52. Van Hemel, P. E. Operator and technician tasks for the head-up display test set and versatile avionics shop test (VAST). In Proceedings of the Industry/Joint Services Automatic Test Conference and Workshop. Washington, D. C.: Aerospace Industries Association, Apr. 1978, 392.

The tasks of operators and technicians for the AN/AVM-11 (V), A7-E Heads-Up Display Test Set, and for the AN/USM-247 (V), Versatile Avionics Shop Test (VAST) are described and compared. The tasks fall into overlapping categories that are common to operators and technicians and across type of Automatic Test Equipment (ATE), with a relatively small proportion identified as tasks specific to operators or technicians for particular equipment. There may be some tasks, involving analysis of test program sets, that do not fall into the category of tasks traditionally required of operators or technicians. Such tasks may become more important in future generations of ATE.

53. Harris, S. T., Puig, J. A., Ricard, G. L. and Weinman, D. G. Motion: Methods and requirements. Paper 78-1576, presented at the AIAA Flight Simulation Technologies Conference, Arlington, TX, 18-20 Sep. 1978, 38-45.

At the present time, the role of motion cues in the effectiveness and efficiency of simulator training is not certain. Before valid training effectiveness studies can be accomplished for motion cueing, the nature of the drive signals for motion platforms and their relations to actual aircraft motions must be accurately determined. This paper reports plans to: (1) Assess the training effectiveness of several of the flight simulator motion-system drive algorithms in current use, (2) Select the most training effective, (3) Develop them for specific Navy tasks, and (4) Relate them to characteristics of the motion systems. The stages of this project; engineering analysis, preliminary algorithm selection, and training effectiveness evaluation are presented herein.

1978

54. Ricard, G. L. and Harris, W. T. Time delays in flight simulators: Behavioral and engineering analyses. In AIAA Simulation Technologies Conference, Sep. 1978, 169-175.

Problems of control produced by delays in simulations of flight are reviewed and data related to the problems that were available from an earlier experiment were analyzed. That study used a lead/lag transfer function to compensate for delays inserted into a closed-loop system, and pilot control performance was measured using various amounts of lag for a given setting of lead. These data indicated that an optimal ratio of lead to lag could be determined, and based upon the changes of phase and gain associated with subjects' best control performance, suggestions are made concerning compensation for delays.

55. Collyer, S. C. and Chambers, W. S. AWAVS, a research facility for defining flight trainer visual system requirements. Proceedings of the Human Factors Society, 22nd Annual Meeting, Detroit, MI, 16-19 Oct. 1978.

The objective of the Navy's Aviation Wide Angle Visual System (AWAVS) program is to recommend design criteria for future flight simulator visual systems. Research leading to this goal will have two facets: improving visual system technology, and determining the effects of visual system parameters on pilot performance and training. The experimental facility is described, and the behavioral research plans are discussed, with emphasis on the carrier landing studies to be conducted during the first phase of the program.

56. King, W. J. New concepts in maintenance training, Aviation Engineering and Maintenance Magazine, Oct/Nov 1978.

This article outlines ongoing NAVTRAEQUIPCEN research into hands-on, intermediate level maintenance training where the technician has to troubleshoot malfunctions down to a component on a printed circuit board. Approaches using 2-D media as well as a 3-D are described, and potential commercial/industrial applications are discussed briefly.

57. Norman, D. A. Recent developments and plans for pilot training devices. Proceedings, Society of Automotive Engineers, Inc., Aerospace Meeting, San Diego, CA, 27-30 Nov. 1978.

Evolved from a research tool, the first of a family of very-low-cost part-task training devices is now being developed and will shortly enter an evaluation phase. Key to the low system cost is use of a minicomputer and graphics display in a small, stand-alone cabinet. Training features are concentrated in software, stored in a library of diskettes. Low cost and portability of systems should lead to wider availability of refresher training and consequent increases in readiness and safety.

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